

PC 99 FAQ and Changes

Important: Features and functionality are described in *PC 99 System Design Guide* as either “required,” “recommended,” or “optional.” Please note:

- “Recommended” features are not expected to become requirements *unless the expectation is explicitly stated in the text*.
If you implement a recommended feature, you must meet the implementation guidelines defined in *PC 99 System Design Guide*. The recommendations are based on the support built into Windows 98 and Windows NT, which is why a recommended feature must meet the guidelines for logo compliance.
- “Optional” features will not become requirements in the future. Typically, “optional” indicates a feature or functionality that is not an element of a Design Guide initiative; however, implementation guidelines are provided to ensure compatibility with Windows operating systems.

PC 99 Basic Requirements

Clarification for Chapter 3, item 3.1: System Performance meets PC 99 minimum requirements.

As with previous PC design guidelines, the authors have specified CPU type and clock speed rather than benchmark tests. This is because no available benchmark tests have been verified as objective.

The intent of this requirement is to define a simple reference metric. The authors understand that system performance is a function of several factors chief among them CPU speed, cache size, system memory, and processor and system busses. Unfortunately, including these factors in the specification would compromise the goal of simplicity.

RAM is treated separately in this specification because of the direct performance relationship between RAM size and the Windows operating system working set.

Clarification for Chapter 3, item 3.5.1: BIOS supports preboot execution environment, with unique system ID provided in print. The specification cited for a unique PXENV system identifier is *Network PC System Design Guidelines*, version 1.0b, plus the additional information in the related FAQ at <http://www.microsoft.com/hwdev/netpc.htm>.

This is the specification upon which the Windows NT 5.0 implementation was based; it is not the later information defined in *Wired for Management, Version 2.0* or later. As indicated in *PC 99 System Design Guide*, one possible implementation for remote boot is defined in *Wired for Management, Version 1.1a*.

Clarification for Chapter 3, item 3.18: Connections use icons, plus keyed or shrouded connectors, with color coding. For PC 99 systems, color coding is required for PC systems, but the color codes listed in *PC 99 System Design Guide* are only recommended. The intent is to standardize the industry on a single color-coding scheme, so these specific colors will become a requirement for systems in future versions of the design guidelines.

For retail peripherals, color-coding is *not* required. However, if color codes are implemented, the scheme must follow the color codes listed in *PC 99 System Design Guide*.

Clarification for Chapter 3, item 3.19: Hot-plugging capabilities for buses and devices meet PC 99 requirements. See “Compatibility Testing Requirements for Hot-Plugging Support for PCI Devices” at <http://www.microsoft.com/hwdev/pci/hotplugtest.htm>.

Clarification for Chapter 3, item 3.28: System does not include ISA expansion devices or slots. Compliance testing for this requirement will begin January 1, 2000.

Clarification for Chapter 3, items 3.51-3.53: WHIIG compliance. These requirements will not be tested or enforced until nine months after *Windows Hardware Instrumentation Implementation Guide* (WHIIG) V.1.0 is published.

USB—PC 99 Requirements

Clarification for compatibility testing requirements related to any device that uses the USB port. This clarification also applies to devices submitted for testing under the 1997–98 logo program. Any device that plugs into a USB port is tested as a USB device—that is, the device provides the capabilities of one or more functions, a hub to the host, or both. As result, the requirements of the *USB Version 1.0* (or later) specification and any related USB device class specification, plus the requirements defined in *PC 99 System Design Guide*, apply for any device that plugs into a USB port.

IEEE 1394—PC 99 Requirements

Correction for Chapter 8, item 8.6: Device command protocols conform to standard device class interfaces. IEEE 1394 devices must comply with appropriate industry-recognized transport and command standards, such as the following:

- IEC 61883 parts 1-6, including CIP (Common Isochronous Packet) headers, CMP (Connection management Procedures), and FCP (Function Command Protocol)
- 1394TA AV/C 3.0 and the AV/C subunit family of specifications
- National Committee for Information Technology Standards (NCITS) SBP-2 transport protocols
- National Committee for Information Technology Standards (NCITS) T10, Reduced Block Commands (RBC)
- National Committee for Information Technology Standards (NCITS) T10 MMC-2, or SFF 8090, Version 3

In addition, drivers for IEEE 1394 must take advantage of WDM-based driver support provided in the operating system.

PCI—PC 99 Requirements

Clarification for Chapter 9, item 9.17: All PCI components comply with PCI Bus Power Management Interface specification. *PCI Bus Power Management Interface Specification, Revision 1.1* or later, is the only industry specification that ensures compatibility with the power management capabilities of Windows NT 5.0, which uses PME# as the wake-up signal.

Clarification for Chapter 9, item 9.11: Device IDs include Subsystem IDs. The Subsystem ID (SID) and Subsystem Vendor ID (SVID) fields are required to comply with the Subsystem ID ECN to PCI 2.1 or the equivalent requirement in PCI 2.2. The Subsystem ID ECN is available to PCI special interest group (SIG) members on the web at <http://www.pcisig.com>. Specifically:

- The PCI SIG assigns valid, non-zero values for the SVID register.
- The vendor assigns values for the SID register. To be valid, these values must be non-zero and unique to a subsystem configuration.

Valid non-zero values in the SVID and SID registers are necessary for the correct enumeration of the PCI device. When these registers are populated correctly for a PCI subsystem or add-on board, the operating system can differentiate between subsystems and add-on boards based on the same PCI chip.

- **Basic Requirement:** The PCI specification and these guidelines require that the SVID and SID registers be loaded with valid non-zero values before the operating system accesses the Configuration Space registers on a PCI device (or function). This is required both at initial operating system load and after any transition of the PCI bus from B3, the unpowered bus state, back to B0, the fully powered bus state.

- **Add-on Board Requirement:** For add-on boards, the SVID and SID registers must be loaded with valid non-zero values. This can be done by several means, but they must meet the basic requirement stipulated earlier in this section. The add-on board SID and SVID registers may not be loaded by any logic not located on the board itself. For example, a solution that relies on on-board BIOS code or driver code to load values into the SVID and SID registers does not meet the basic requirement. This is because the code is not guaranteed to run before the operating system accesses the PCI configuration registers.
- **Requirement for Subsystems on System Boards:** All subsystems on system boards that contain a PCI device, except PCI-to-PCI bridges and core chip sets, must meet the basic requirement stipulated earlier in this section.

If a PCI device is designed to be used exclusively in a subsystem on the system board, then the system-board vendor can load valid non-zero values into the SVID and SID registers using code that is guaranteed to run before the operating system accesses the registers. The system BIOS power-on self test (POST) code or ACPI control methods (_PS0 for PCI bus B3 to B0 transitions) are guaranteed to run before the operating system accesses the SVID or SID registers. Once the operating system has control of the system, the SVID and SID registers must not be directly writable—that is, the read-only bit must be set and valid.

For information about using the POST method for loading SVID and SID register values related to multiple-monitor support for display devices, see requirement 14.45, “Each device has a Plug and Play device ID,” in *PC 99 System Design Guide*.

Note: If you are designing new parts that integrate new capabilities, please contact WHQL for clarification about the SID and SVID requirements for that functional device.

Testing clarification to Chapter 9, item 9.16: Systems that support hot plugging for any PCI device use ACPI-based methods. See also “Compatibility Testing Requirements for Hot-Plugging Support for PCI Devices” as defined at <http://www.microsoft.com/hwdev/pci/hotplugtest.htm>.

PC Card—PC 99 Requirements

Note: For information about implementing R2 version cards to use only 3.3 volts, see the white paper “PC Card Voltage Requirements and the Windows operating system” earlier in this newsletter.

Clarification to Chapter 12, item 12.19: CardBus controllers and cards implement PCI power management specification. CardBus cards (which are by definition PCI devices) must comply with *PCI Bus Power Management Interface Specification, Revision 1.1* or later, in order for power management to be implemented properly under Windows NT 5.0, which uses PME# as the wake-up signal. This is the only industry specification that ensures compatibility with the power management capabilities of Windows NT 5.0.

Note that power management requirements for 16-bit PC Card cards are defined separately in requirement 12.18.

I/O Ports and Devices—PC 99 Requirements

Correction to Chapter 13, item 13.5: System includes USB game pad or joystick. The requirement is meant to state that if a game pad or joystick is included in a PC 99 system, it should be implemented using USB. It is *not* required to include any such devices on a PC 99 system.

Note: No devices that use legacy or proprietary ports can be included in a PC 99 system.

Correction to Chapter 13, item 13.43: Smart card reader supports Protocol and Parameter Selection (PPS). The correct citation for the specification is ISO 7816-3 (1997-12-15) Section 7.

Correction to Chapter 13, item 13.46: Smart card reader supports the Power Down command.
The correct citation for the specification is ISO 7816-3 (1997-12-15) Section 5.4.

Graphics Adapters—PC 99 Requirements

Clarification to Chapters 3 and 16, items 3.40 and 16.1: Color monitor is DDC-compliant with unique EDID identifier. The support required for Version 3.0 of these standards also cover the earlier version and revisions, and as such, are the correct references for both Windows NT 5.0 and Windows 98.

Correction to Chapter 14, item 14.14.4: Scaling (hardware supports video overlay surface with scaling). The ability to shrink and zoom by a variable factor of up to 8:1 in one-pixel increments is required, and the ability to shrink by a variable factor of up to 16:1 in one-pixel increments is recommended.

Correction to Chapter 14, item 14.15: Hardware supports VGA destination color keying for video rectangle. The example for a specific color/color range includes 8-bit, 15-bit, and 24-bit SVGA modes (4-bit mode is not required).

Video and Broadcast Components—PC 99 Requirements

Clarification to Chapter 15, item 15.29, “System provides a licensed CSS copyright protection scheme.” Playback of regionalized movies must be handled in accordance with the CSS requirements and the interfaces as defined in the Mt. Fuji 2.0 specification. Phase II regionalization (RPC II) is not required until after January 1, 2000.

Important: As noted in the disclaimer for *PC 99 System Design Guide*, Intel and Microsoft do not make any warranty of any kind that any item developed based on these specifications, or any portion of a specification, will not infringe any copyright, patent, trade secret, or other intellectual property right of any person or entity in any country. It is your responsibility to seek licenses for such intellectual property rights where appropriate. Intel and Microsoft shall not be liable for any damages arising out of or in connection with the use of these specifications, including liability for lost profit, business interruption, or any other damages whatsoever.

Monitors—PC 99 Requirements

Correction to Chapter 16, item 16.12: External monitor meets DDC2B and EDID standards.
EDID content must indicate at least one VESA mode at 75 Hz, or better, for each resolution supported.

Audio—PC 99 Requirements

Clarification to Chapter 17, item 17.4: Audio performance meets PC 99 requirements.

Windows 98 and Windows NT 5.0 provide software mixing and sample rate conversion (SRC), which eliminate the need for hardware to support all possible rates. Therefore, PC 99 requires the hardware to support only two key rates: 44.1 and 48kHz:

- 44.1kHz is required for efficiency reasons. Most game content uses a sampling rate that is an integer multiple of 44.1 kHz. In addition, CD audio is 44.1kHz. When the highest input stream is 44.1kHz and below, the optimal way to operate the audio output is to convert everything to 44.1kHz and run the audio device at this rate. This provides the best quality and least CPU overhead.
- 48kHz is required because it is the highest frequency that consumer content uses. DVD audio is a good example. When 48kHz content is present, the operating system will switch the audio output to 48kHz.

Clarification to Chapter 17, item 17.22: PCI devices support non-DWORD-aligned audio buffers.
Compliance testing for this requirement will begin January 1, 2000.

Modems—PC 99 Requirements

Clarification to Chapter 19, item 19.3: Modem supports V.250 AT command set. Windows Unimodem does not use the following commands directly; therefore, these are not in the sample INF and are not required in PC 99: +IFC, +ICF, +MA, +EB, +ESR, +ETBM. These commands are only required if the function is controllable in the modem by way of AT commands; in that case, the standard V.250 commands defined here shall be included.

Clarification to Chapter 19, item 19.11: Voice modem supports ITU V.253 (AT+V). This requirement includes support for +VTR (full-duplex voice).

Clarification to Chapter 19, item 19.38: Device complies with device power management reference specification. Support for power states D0 and D3 cold are required for PCI modems, including wake on ring.

Clarification to Chapter 19, item 19.39: Device supports wake-up events. PCI devices are required to support D3 cold on a PCI 2.2-based system with auxiliary power. On all other power-managed buses (such as USB), support for either D2 or D3 is OK.

Clarification to Chapter 19, item 19.29: Driver handles thread priorities appropriately.

- 19.29.2: Revised sentence: “At any instant in time, the total execution time requires for all DPCs that have been queued by a WDM driver-based modem, but have not yet been dequeued and began execution, should not exceed 500 milliseconds.”
- 19.29.3: Revised sentence: “A WDM driver-based modem should not continuously disable thread preemption for more than 4.4 milliseconds. This guideline accommodates 400 microseconds of interrupts being disabled together with two back-to-back episodes of 2.0 milliseconds of extended processing at DISPATCH_LEVEL, as up to four 500-microsecond DPCs execute sequentially.”

Clarification to Chapter 19, item 19.30: Driver tolerates reasonable operating system and bus latencies.

- 19.30.1: Revised sentence: “A driver-based modem should be able to tolerate a period of 4 milliseconds with interrupts disabled.”
- 19.30.2: Revised sentence: “A driver-based modem should be able to tolerate a continuous period of 8 milliseconds during which a queued DPC is held off from execution, possibly by other DPCs.”
- 19.30.3: Revised sentence: “A WDM driver-based modem should be able to tolerate a 16 millisecond period when thread scheduling is continuously disabled.”

See the related article on WDM-based soft modems at <http://www.microsoft.com/hwdev/modem/>.

Networking—PC 99 Requirements

Correction to Chapter 20, item 20.31: ATM adapter supports a minimum number of simultaneous connections. For the Client (Integrated ATM/ADSL adapter), the minimum required support is for 16 simultaneous connections.

Storage—PC 99 Requirements

Correction to Chapter 18, item 18.2: Removable media devices support media status notification. Optical devices such as PD and MO should support RBC. ATAPI optical devices and SCSI optical direct access drives should support the MMC-2 standard.

Correction to Chapter 18, item 18.22: CD and DVD device supports accurate digital audio transfers. CD and DVD drives must implement “CD Capabilities and Mechanical Status Page” (2Ah), as defined in the MMC-2 standard. The bit “CD-DA Commands Supported” must be set and the functionality must be implemented.

CD and DVD drives must also implement and set the bit “CD-DA Stream is Accurate” of “CD Capabilities and Mechanical Status Page.” The READ_CD command and READ_RAW commands

must provide sector-accurate reads, as defined in MMC-2. Data alignment accuracy must be equivalent to that of data reads. Because of the lack of ECC bytes used for data tracks, the data itself may contain inaccuracies due to physical defects of the media.

Correction to Chapter 18, item 18.24: DVD drive meets minimum compatibility requirements.

Recommended: Support for ECMA-274 (+RW) and ECMA-272, 273 (DVD-RAM) and DVD-R.

Correction to Chapter 18, item 18.27: DVD device supports defect management. Defect management for +RW media is defined in ECMA-274.

Imaging—PC 99 Requirements

Clarification to Chapter 22, item 22.12: USB device does not saturate the USB bus. This limitation refers to the bandwidth a device can request for *isochronous* transfers. Other types of data transfers are managed by the host controller.